

WHAT IS BEING CLAIMED IS:

I. A gemstone laser marking system comprising:

a gemstone mounted on a fixture;

a pulsed laser for generating a laser pulse having a pulse duration of

5 less than 1 nanosecond;

focusing means for focusing said laser pulse onto a surface of said
gemstone to be marked;

means for displacing said gemstone with respect to said laser pulse
in a three orthogonal axes mode of operation.

2. The gemstone laser marking system as recited in Claim 1 wherein a video camera is aligned with said gemstone for recording video images of said gemstone being marked.

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3. The gemstone laser marking system as recited in Claim 2 wherein a display means is in electrical communication with said video camera for providing a viewable image of said gemstone being marked.

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4. The gemstone laser marking system as recited in Claim 1 wherein said displacement means includes means for driving said gemstone and said fixture in a predetermined path.

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5. The gemstone laser marking system as recited in Claim 1 wherein said displacement means includes means for driving said focused laser pulse in a predetermined path.

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6. The gemstone laser marking system as recited in Claim 5 wherein said displacement means includes:

- (a) steering optics for intercepting said laser pulse and directing said laser pulse towards said surface of said gemstone in a predetermined path; and,
- (b) mirror means for intercepting and re-directing said laser pulse from said pulsed laser to said gemstone, said mirror means being under galvanometric control.

7. The gemstone laser marking system as recited in Claim 3 wherein said display means is a video monitor.

8. The gemstone laser marking system as recited in Claim 1 wherein a computer control system is in electrical communication with said pulsed laser for controlling said pulse duration.

9. The gemstone laser marking system as recited in Claim 4 wherein a computer control system is in electrical communication with said means for driving said gemstone and fixture in order to control said predetermined path.

10. The gemstone laser marking system as recited in Claim 6 wherein a computer control system is in electrical communication with said steering optics for controlling said predetermined path.

11. A method of laser marking a gemstone comprising the steps of:
- (a) generating a laser pulse having a pulse duration of less than 1 nanosecond;
 - (b) focusing said laser pulse onto a surface of a gemstone;
 - (c) displacing said surface of said gemstone with respect to said focused laser pulse along three orthogonal axes.

12. The method of laser marking a gemstone as recited in Claim 11 wherein said step of displacing said surface of said gemstone with respect to said focused laser pulse includes the translation of said gemstone with respect to said focused laser pulse along a predetermined path.

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13. The method of laser marking a gemstone as recited in Claim 11 wherein said displacing of said surface of said gemstone with respect to said focused laser pulse includes translation of focusing optics along a predetermined path.

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14. The method of laser marking a gemstone as recited in Claim 11 wherein said step of displacing said surface of said gemstone is followed by a video camera viewing said gemstone.

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15. The method of laser marking a gemstone as recited in Claim 14 wherein images produced by said video camera are stored in a memory storage device.

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16. The method of laser marking a gemstone as recited in Claim 14 wherein images generated by said video camera are provided on a display device.

17. The method of laser marking a gemstone as recited in Claim 14 wherein images produced by said video camera are selectively magnified.

5 18. The method of laser marking a gemstone as recited in Claim 11 wherein said step of generating a laser pulse is controlled through a computer control system in electrical communication with a pulsed laser, said computer control system allowing a user to selectively control said pulse duration.

10 19. The method of laser marking a gemstone as recited in Claim 12 wherein a computer control system is in electrical communication with a displacement means for displacing said gemstone, said computer control system allowing a user to selectively input and control said predetermined path.

15 20. The method of laser marking a gemstone as recited in Claim 13 wherein a computer control system in electrical communication with focusing optics allows a user to selectively input and control said predetermined path.